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Annotated Briefing

'True Cost of a Sailor' Study: Methodology and Preliminary Results

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Outline

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The Director of the Naval Center for Cost Analysis asked CNA to participate in the design and implementation of a study relating to indirect costs of naval personnel. This annotated briefing documents our participation to date, which was provided under a CNA Quick Response (90-day) project.

We begin with a discussion of the background and objectives of the study. Next, we describe the analytical structure that we have proposed for guiding the work. That leads to a description of the methodology planned for Phase I of the effort. We then present and comment on the empirical results generated by CNA. The final slide identifies issues requiring further consideration and analysis before completion of Phase I.

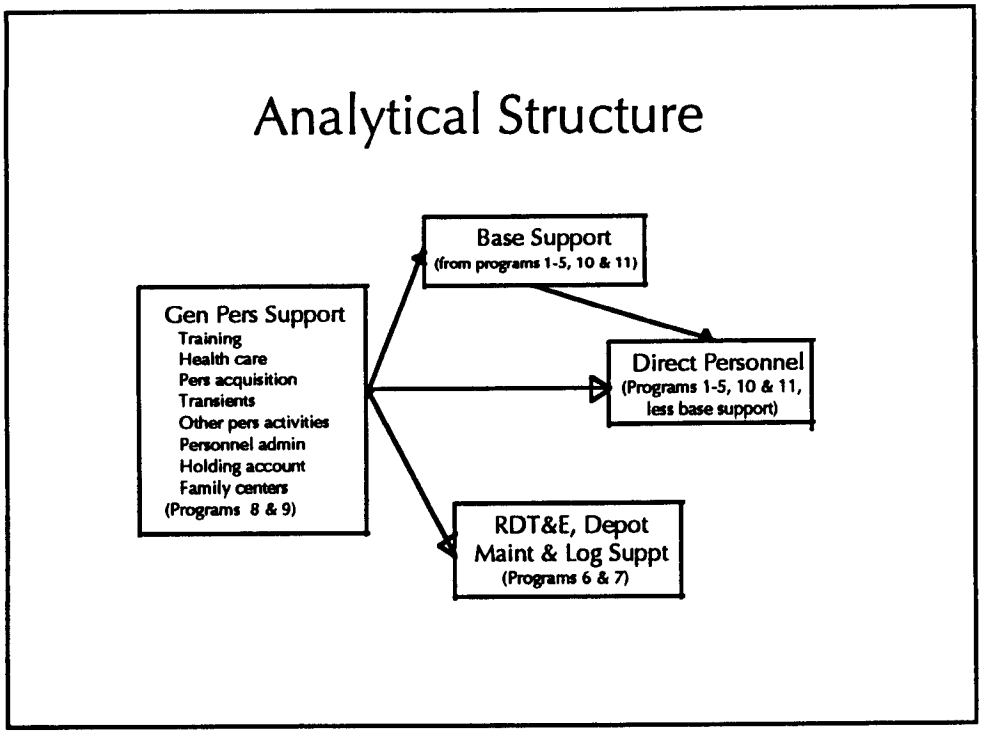
Background and Objectives

- CNA supporting NCCA in 'True Cost of a Sailor' study
- Overall study focus: estimate ***changes in costs*** resulting from changes in operating force personnel
- Phase-I objective: develop methodology and preliminary results

The Naval Sea Systems Command issued the study's initial tasking in March 1996. That tasking was amplified by the Deputy Assistant Secretary of the Navy (Ships) in June 1996. The study was subsequently titled, "True Cost of a Sailor." NCCA asked CNA to participate because of our background and recent work in the area of indirect personnel costs.

The overall objective, or theme, of the project is to develop an improved capability for estimating the changes in costs, direct and indirect, that result from changes in the numbers and types of operating force personnel. The words *changes in costs* are highlighted in the slide to underscore an important conceptual point. Because the products of the study are intended principally to inform the acquisition-decision process, the relevant measures of cost are those that quantify the cost consequences of alternative decisions. This stands in sharp contrast to the notion of *allocating* pools of indirect costs by various accounting principles. The latter practice is normally associated with cost-recovery systems or break-even pricing.

The study will have two phases. Objectives of Phase I, to be completed in February 1997, are to develop a methodology for the full effort—including evaluation of alternative databases—and to produce a set of preliminary results for use in near-term acquisition reviews.



The analytical foundation for this project is a way of viewing the organization and functions of naval personnel that is not necessarily shared by all personnel costing systems. We see those resources as existing in four subgroups, which can be conveniently described in terms of the 11 major defense programs. First, there are the direct (operating-force) personnel from programs 1 through 5, 10, and 11, less those persons associated with base-operating support. The programs are Strategic Forces, General Purpose Forces, C^3I and Space, Mobility, Guard and Reserve Forces, Support to Other Nations, and Special Operations Forces. (Our scope is limited to active-duty personnel.)

We posit that changes in direct personnel lead to changes in base-operations personnel. Thus a key task, which is being performed by NCCA, is to quantify that linkage empirically. Another subgroup, made up of persons from programs 6 and 7 (RDT&E and Central Supply and Maintenance), carries out a different set of support functions of a nonpersonnel nature.

Personnel in each of these three subgroups require the full range of general personnel support shown in the slide, and provided through program 8 (Training, Medical and Other General Personnel Activities) and program 9 (Administration and Associated Activities). We present CNA's preliminary estimates of these linkages later in the briefing.

Phase-I Methodology

- Build time series for FY 1980–1996 from Historical FYDP and OPNAV programming database (WINPAT)
- Estimate direct-indirect personnel relationships statistically
- Identify priorities and approaches for follow-up work

To provide empirical content to the analytical structure that was just described, we first need a database. Moreover, because we wish to build a set of results that reflect changes in costs stemming from changes in direct personnel, time series data offer essentially the only basis for estimating those effects. We have selected data reflecting the outcome of Navy programming and budget-execution processes for the period FY 1980–1996. Sources for this 17-year time series are the Historical FYDP (FY 1980–1988) and the OPNAV programming database, commonly known as WINPAT (Windows Program Analyst's Toolkit). Generally speaking, the support-cost relationships are assumed to be linear, and we can estimate their parameters by applying statistical regression methods to the database. Certain statistical problems associated with analysis of this type of data have been examined and documented in CNA Research Memorandum 95-203, December 1995.

As noted earlier, development of the preliminary cost estimates constitutes only a portion of Phase I. Other sources of personnel cost data, especially Billet Cost Factors and Navy Composite Standard Rates, are relevant and require evaluation. In addition, issues regarding integration, refinement, and packaging the Phase-I results also warrant consideration.

Preliminary Results—General Personnel Support

	Officers	Enlistees
Transients		
Officers	------	------
Enlistees	------	0.044
Personnel Holding Acct		
Officers	------	------
Enlistees	------	0.012
Recruiting		
Officers	------	0.001
Enlistees	------	0.007
O&MN*	------	0.126

*Thousands of FY 1996 dollars

This slide lists the estimates for the first three categories of general personnel support: Transients, Personnel Holding Account, and Recruiting. Of the three, only Recruiting has Operation and Maintenance, Navy (O&MN) funding associated with it. The interpretation of the estimate of 0.044 for the enlisted Transients account is that a change of 100 enlistees Navy-wide results in a change of 4.4 enlistee transients. (Although the Transients account is an indirect cost associated with all Navy personnel, the estimate was developed for eventual application to operating-force personnel. The same applies to all other categories of general-support costs.)

We do not show a corresponding estimate for officers because the analysis showed no statistically significant change in officer transients resulting from observed changes in all other officers. Results for the Personnel Holding Account directly parallel those for Transients, except that the enlistee estimate has a lower (but still statistically significant) value of 0.012. In the case of Recruiting, a change of 1000 enlistees is estimated to result in a change of 1 officer and 7 enlistees engaged in recruiting functions. The O&MN cost change is estimated to be $126 per change in enlistee.

Preliminary Results—General Personnel Support (Cont'd)

	Officers	Enlistees
Personnel Admin		
Officers	------	------
Enlistees	0.002	0.002
Other Pers Activities		
Officers	------	------
Enlistees	------	------
Health Care		
Officers	------	------
Enlistees	0.012	0.012

For each category shown on this slide, the righthand-side variable in the regressions was the sum of officers and enlistees. The premise is that the requirement for these services is independent of whether a person is an officer or an enlistee. That explains why the same estimates apply to each for Personnel Administration and Health Care. Officers performing functions in each of the three categories shown here were found to not change significantly with changes in all other personnel. The same finding applies to O&MN costs associated with Personnel Administration and Other Personnel Activities. (Funding for Health Care operation and maintenance is provided out of a separate Defense-wide appropriation.)

The limited amount of statistically significant results thus far is somewhat disappointing in a strict analytical sense, and it could be due in part to weaknesses in the data that have not yet been detected. However, it further underscores a point made earlier in the briefing. The interest here is in empirically verifiable *changes* in costs. If instead the approach involved some form of allocation of indirect cost pools across the user groups being served, the results would evidently be far in excess of the "true costs" of naval personnel.

Preliminary Results—General Personnel Support (Cont'd)

	Officers	Enlistees
Officer Training		
Officers	0.140	-----
Enlistees	0.094	-----
O&MN*	4.207	-----
Enlistee Training		
Officers	-----	0.011
Enlistees	-----	0.298
O&MN*	-----	0.491
General Training		
Officers	0.002	0.002
Enlistees	0.021	0.021
O&MN*	0.901	0.901

*Thousands of FY 1996 dollars

The picture changes substantially when we come to the final and largest category, Training. We have divided the training activities into those associated strictly (or almost entirely) with officers, those associated with enlistees, and those for which a distinction can't be made. As the numbers on the slide suggest, the training establishment has exhibited considerable response to changes in the size of the personnel force. Changes in the number of officers lead to changes in both officers and enlistees involved in officer training, and the same is true of changes in the force of enlistees. In addition, we found statistically significant O&MN cost effects for all types of training.

One thing not noted on the slide but of considerable importance is that aviation training, while normally classified as officer training, has been excluded from the database. The costs of aviation training are sufficiently large relative to all other forms of officer training that we considered it misleading to link those costs to changes in officers as a whole. In addition, this treatment seems consistent with one of the ultimate objectives of the project, which is to develop a community-specific set of costing tools.

Phase-I Issues for Further Consideration and Analysis

- Computational integration of preliminary results
- Potential for refinements through additional analysis of existing database
- Potential for near-term use of existing billet cost factors
- Limitations on force structure analysis imposed by preliminary results

Several steps remain to complete Phase I. First, it turns out that the algebraic manipulations needed to integrate the base-operating support and general-support linkages are not entirely trivial. Further thought and analysis are required on that front. Second, it's entirely possible that closer inspection of the underlying data and how they have been aggregated could produce improvements in the estimates generated to date.

Third, while modifications and widespread use of Billet Cost Factors are thought of as longer-term study objectives, there could well be ways in which the information embedded in those factors could be used to sharpen our Phase-I products. A probe of that sort seems warranted. Finally, there is a lingering conceptual question that should not be dismissed. It has to do with whether cost estimates stemming from our present methodology, which are designed to capture indirect costs that are unambiguously personnel in nature, may understate the full indirect-personnel consequences of sizeable force structure changes. This is a difficult conceptual question that may never be resolved to everyone's satisfaction, but it is sufficiently important to continue to discuss and debate as the work proceeds.